AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.6.1 REPRODUCTION (PACK 3)

SCORE	PERCENTAGE
/227	%

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Q1.

(a) (i) characteristic

1

(ii) gene

1

(iii) gamete

1

(b) sexual

1

asexual

1

clones

1

[6]

Q2.

(a) (i) circle

mark independently

1

unshaded

could be in body of script

1

(ii) (Harriet) dd

in first box

1

DD

if another letter is chosen it must be used throughout and upper or lower case must be clear

1

Dd

1

(b) (i) to check for the D allele.

1

(ii) any **one** from:

- may harm / kill foetus / embryo / baby / mother
  allow could affect the baby
- immoral / unethical / religion
  ignore playing God
  ignore references to unnatural
  ignore wrong unqualified

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ignore expense / prejudice unqualified
ignore lack of permission
ignore results are unreliable

1

[7]

Q3.

(a) any **one** from

- chromosomes in pairs
- inherited one of each pair from each parent
- one of each pair in egg **and** one of each pair in sperm
- so sex cells / gametes can have half the number
  allow need to pair during cell division / meiosis

1

(b) any **two** from:

- <u>code</u>
- combination / sequence of amino acids
- forming specific / particular proteins / examples
  *If **no other mark** gained allow reference to controlling characteristics / appearance for **1** mark*

2

(c) (i) C

1

(ii) 30

1

(d) (i) for growth / repair / replacement / asexual reproduction
*do **not** accept incorrect qualification, eg growth of cells **or** repair of cells*
they equals cells therefore do not accept they grow etc

1

(ii) 44 **or** 22 pairs

1

[7]

Q4.

(a) sexual reproduction

1

(b) any **three** from:

- coat colour inherited / controlled by genes
- it has horse and zebra features

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- gets gametes from both parents
- genes / DNA / chromosomes / genetic information in gametes
- zorse receives genes / DNA / chromosomes / genetic information from parents

3

[4]

Q5.

(a) 2 and 3

1

(b) cell **P** has an X chromosome; cell **R** has a Y chromosome

1

(c) any **two** from:

- (formed from) different egg / 2 eggs
- (formed from) different sperm / 2 sperm
- have different genes / alleles / chromosomes / DNA
  allow genetics

2

(d) (i) stem cells

1

(ii) the cells divide

1

the cells differentiate

1

(iii) (medical) research / named eg growing organs
or

medical / patient treatment
allow (embryo) cloning
*do **not** allow designer babies / more babies*

1

(iv) any **one** from:

- ethical / moral / religious objections
  ignore cruel / not natural / playing God
- potential harm to embryo
  allow deformed
  ignore harm to mother

1

[9]

Q6.

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(a) 1 in 4 / 1/4 / 1: 3 / 25% / 0.25

*do **not** accept 3:1 / 1:4 / 2:6*

1

(b) **either** from C **and** D

accept synonyms for dominant / recessive eg Normal / faulty

accept genetic diagram if clearly referring to correct individuals or genotypes on family tree

allow 'gene' for 'allele'

any **three** from:

- C **and** D have disorder

  *ignore **'**C & D are carriers'*

- I/J don't have disorder

- C **and** D have dominant **and** recessive alleles

- recessive alleles from C **and** D passed to I/J **or** I/J have two recessive alleles

  *NB if allele was recessive then all offspring of C **and** D would have the disorder = **3** marks*

or from A **and** B

assume response refers to A + B unless contradicted

- A is homozygous recessive / rr, **and** B is heterozygous / Rr can be shown in words or symbols

  allow any symbol

- offspring can be rr **or** Rr described

  allow without key

3

(c) (i) (embryos) checked for inherited / genetic disorders / conditions

accept diseases for disorders

1

(ii) any **three** from:

- C/D have disorder / have dominant allele

  accept disease / condition

  accept 'gene' for 'allele'

  ignore reference to 'carriers'

- chance of embryo / foetus / child having disorder **or** may pass on alleles for disorder to their offspring

- C/D might want to decide on termination **or** prepare for child with disorder

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- G **and** H don.t have disorder / both homozygous recessive / have no dominant alleles (for this disorder)
- so offspring (of G **and** H) cannot / don.t have disorder

3

[8]

Q7.

(a) characteristics

1

(b) genes

1

(c) chromosomes

1

(d) mitosis

1

(e) asexual

1

[5]

Q8.

(a) cell membranes

1

(b) (i) two recessive / cystic fibrosis / faulty / diseased / the allele(s) / genes

two can be implied by second marking point

ignore chromosomes

1

from Bob **and** Carol / both parents / the parents

*if no other marks awarded 'Carol is a carrier' gains **1** mark*

1

(ii) (inherited) dominant / normal allele / gene

1

from Carol / mother

ignore references to recessive allele / gene from father / Bob

*if no other marks awarded he has <u>just</u> / <u>only</u> one recessive allele gains **1** mark*

1

(c) (i) reduce number of people with cystic fibrosis (in population)

or

reduce health-care costs

or

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expensive to have baby with cystic fibrosis

accept to allow decision / emotional argument qualified eg allows abortion

or

allows people to make choices about termination

or

help to prepare financially / emotionally etc

1

(ii) any **one** from:

- possible damage / risk to embryo / fetus / baby
  allow possible harm / risk to mother
- screening / it is expensive
- (may) have to make ethical / moral / religious decisions
  ignore not natural / playing God / unethical / immoral / religious unqualified
- right to life

1

[7]

Q9.

(a) any **two** from:

- to combine / use amino acids
  *do **not** allow to make amino acids*
- in specific / particular / correct / right order
- to manufacture protein / enzymes / hormones
  allow examples of proteins / enzymes / hormones

2

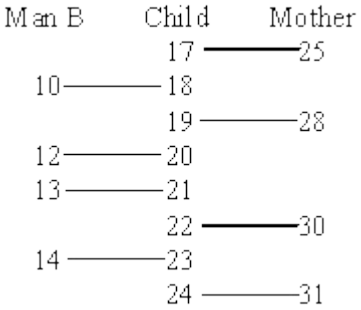
(b) (i) (man) B

*no mark for this **but** max **2** marks if A given*

any **three** from:

- child gets DNA / bars / lines from mother and father / parents
  ignore genes / chromosomes
- (child has) mother's 25 / 28 / 30 / 31
  or child gets 17 / 19 / 22 / 24 from mother
- (child has) man B's 10 / 12 / 13 / 14
  or child gets 18 / 20 / 21 / 23 from B

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contradictions disqualify 2nd and / or 3rd marking points
ignore genes / chromosomes

- no bars / DNA / lines from man A correspond to child

3

(ii) any **two** from:

- gametes / eggs / sperm
- contain only half of (mother's / father's) DNA / chromosomes / genes / genetic information
- due to meiosis

2

[7]

Q10.

(a) have identical genes / chromosomes / genetic material

1

since asexual reproduction

accept mitosis

1

(b) mixture of genes / chromosomes / genetic material from two parents

accept meiosis

1

sexual reproduction / fusion of gametes

1

(c) public misunderstand technique as cloning **or** worried about large numbers of clones **or** moral / ethical / religious issues **or** unnatural process **or** scientists must not play god **or** technique may lead to embryo death

*do **not** allow mark for embryos lost*

1

[5]

Q11.

joining

1

sexual

1

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identical

1

asexual

1

clones

1

[5]

Q12.

in the correct order

DNA

1

23

1

XX

1

XY

1

recessive

1

dominant

1

[6]

Q13.

(a) A = meiosis

accept 'mieosis'

*do **not** accept 'miosis'*

1

B = mitosis

*do **not** accept 'meitosis' etc*

1

(b) fertilisation allow conception

1

(c) (i) 23

1

(ii) 46

1

[5]

Q14.

(a) chromosome

accept chromosomes

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1

(b) drawing shows:

1

just 2 chromosomes

one long + one short

1

[3]

Q15.

(a)

Ampicillin	Tetracycline
✓	–
–	–
✓	✓

*accept blank **or** cross **or** –*

*1 st: mark by rows to maximum **3** marks*

*2 nd: if no marks by rows, mark by columns to maximum **1** mark*

*table completely blank = **0** marks*

3

(b) 1st: Yes (no mark)

*if 'no' - read on for logical argument e.g. loss of plasmid **or** gene mutation*

2nd: all formed from same original cell

must be <u>one</u> cell i.e. bacterium

1

by asexual reproduction / no fusion / not sexual

allow reference to 'mitosis'

1

offspring cells are genetically identical **or**
all have a copy of the insulin gene / of the plasmid

1

[6]

Q16.

(i) clones

accept other positive indications

1

(ii) same genes / alleles / DNA

*accept same genetics / genetic information do **not** accept same chromosomes*

1

grown in same (environmental) conditions **or** correct eg – same amount of water / same temperature / same amount of light

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1

[3]

Q17.

(a) one from each parent / one from egg and one from sperm

*do **not** accept egg and sperm join / fertilisation unqualified*

1

(b) (i) nn

accept a ring around printed nn

1

(ii) Nn Nn

1

[3]

Q18.

(a) (i) **Aa** or aA

1

(ii) allele / gene for vestigial wings / **a** is recessive
or vestigial is recessive **or A** is dominant **or**
A would override the effect of **a or A** present gives long wings

1

(b) parental genotypes correct – both **Aa**

NB can pick up chain of logic at any point correctly derived from candidate's previous point

1

gametes correctly derived from **P** genotypes

1

offspring genotypes correctly derived from gametes

1

3:1 ratio recognised

wrong cross and not 3:1 ratio = max 2

1

[6]

Q19.

eggs

accept gamete once

1

ovaries

1

sperms

accept gamete once

1

testes

1

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sexual

1

gametes

*allow egg **and** sperm once*

1

fertilisation

1

asexual

1

[8]

Q20.

(a) genes/DNA

1

female/girl/woman/ 

*both required **in** the correct place for this last mark*

male/boy/man/ 

*do **not** accept homo/heterogametic, homo/heterozygous*

1

(b) parents correct

n.b if parents are wrong, candidates can score a maximum of 3 marks

1

gametes correct

allow just 1 mark for female

1

combinations correct

1

correct analysis of the 50:50 ratio of what is written

1

[6]

Q21.

(a) (i) gametes i.e. B b and B b

1

correct combination of genotypes i.e. BB, Bb, Bb, bb

1

correct analysis of phenotypes i.e. 3 black fur 1 with brown fur

1

(ii) award one mark for the recognition
that it is down to chance (which two

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gametes fuse) and not simply 'because it's a prediction'

*do **not** accept mutation*

1

(b) (i) **B** is dominant/ an allele is dominant if it is expressed in the heterozygous phenotype

candidates are likely to use a variety of ways of expressing their ideas

1

b is recessive/ a recessive allele is not expressed in the presence of its contrasting allele

*do **not** accept powerful*
*do **not** accept stronger*

1

(ii) alleles are different forms of a gene controlling a characteristic and occupying the same site on homologous chromosomes (e.g. B or b)

1

genes are the units of DNA/sites on chromosomes carrying the information that determines characteristics (e.g. bB)

1

(c) homozygous: BB / bb / possessing a pair of identical alleles for a character/true breeding

give credit to an explanation using a diagram

1

heterozygous: Bb / carrying a pair of contrasting/different alleles for a characteristic

*do **not** accept references to xx, xy*
*do **not** accept gene by itself*

1

[10]

Q22.

(i) (sweet) peas

1

(ii) homozygous parents crossed [1]

heterozygous (F1) offspring crossed [1]

recognition of yellow dominant over green [1]

recognition that results support 3:1 **or** 0.75 to 0.25 ratio

*up to **4** marks awarded for an understanding of the monohybrid cross and the expected outcome*

4

[5]

Q23.

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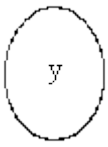
one mark for each of the following comparisons to a maximum of **6**

*candidates **must** make a clear comparison*

meiosis	**mitosis**
sexual	asexual
gametes	growth
ovary **or** testes **or** gonads	all other cells
half number of chromsomes	same number of chromosomes
haploid **or** 23 chromosomes	diploid **or** 46 chromosomes
reassortment **or** variation possible **or** not identical	no reassortment **or** no variation **or** identical
4 cells produced	2 cells produced
2 divisions	1 division

[6]

Q24.

(a) 

clearly labelled 'y'

1

mark the offspring in two horizontal rows

1 mark for each fully correct row

***allow** transferred error if parent 2 is incorrect*

XX *XX*

1

XY *XY*

accept YX

1

(b) parent 1

accept XX

1

(c) 50:50
or
equal **or** even
or
1:1 **or** 50%

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accept 1/2 ***or*** *2/4*

1

[5]

Q25.

(a) **award one mark for each key idea**

energy released **or** energy transferred **or** respiration

allow provides ***or*** *gives*

do ***not*** *allow produces* ***or*** *makes*

3

near to the site of movement **or** energy available quickly **or** more energy

accept allows more mitochondria to fit in

(mitochondria) packed (around filament) **or** efficient arrangement **or** spiral arrangement

(b) contains chromosomes **or** genes **or** DNA

not *genetic material*

1

(which) contribute half (the genes) to the fetus **or** offspring

23 chromosomes ***or*** *half the genes*
or *reference to X,Y chromosome determining sex (if the notion of halfness is there)*
nucleus contains half genes for the offspring = 2 marks

1

[5]

Q26.

(a) breed (together)

accept have same number of chromosomes

do ***not*** *accept have the same number of genes*

1

to produce <u>fertile</u> offspring

1

(b) male **or** testes

accept dog

1

testes **or** male

accept testis

do ***not*** *accept testicles*

1

ovary **or** ovaries

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1

gametes

1

fertilisation

*do **not** accept conception*

1

fetus **or** zygote **or** embryo

*do **not** accept baby **or** puppy*

1

(c) genetic information **or** genes **or** chromosomes **or** DNA

*do **not** accept characteristics by itself*

1

(comes) **from** two parents

*accept **from** both parents*

1

[10]

Q27.

(a) (i)

if two nuclei drawn then maximum two marks

1

6 chromosomes

1

same 3 homologous pairs

1

nuclear membrane drawn

1

(ii) 3 chromosomes

1

1 from each homologous pair

1

(b) (i)

parent line must be separate

heterozygous parents Tt × Tt

*maximum of **2** marks if parental genotype is wrong*

gametes correct T t T t

1

genotypes TT Tt Tt tt

1

(ii) correct analysis of chance i.e. 1 in 4 **or** 25%

1

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(iii) 50% **or** 1 in 2

1

[10]

Q28.

(a) (i) gametes correct

allow by implication from line diagram
only need on X from female

1

offspring genotype correctly derived

on suitable diagram

	X	**X**
X	XX	XX
Y	XY	XY

or

	X
X	XX
Y	XY

1

(ii) 1:1 **or** 50% **or** ½ **or** 0.5 **or** 1 in 2
or 1 out of 2 or 50 : 50

*do **not** accept 50/50*
accept 'equal' (probability)

1

(b) Y chromosome needed for male child

1

only male has the Y **or** wives had only X (chromosomes)
or sex determined by the sperm

1

[5]

Q29.

(a) on chromosomes/DNA within the nucleus

each for 1 mark

2

(b) parental genotypes correct i.e. Aa Aa;
gamete genotypes correct i.e. A or a A or a/correct lines;
F1 genotypes correct i.e. AA Aa Aa aa;
aa recognised as child with cystic fibrosis

each for 1 mark

4

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(d) (i) molecule has two long strands/double helix;
idea of held together by (weak) bonds;
each strand has 4 different types of base;)
which pair with specific bases in opposite strand;)
when strands separate;) OWTTE
each strand acts as a 'complementary' template;)
makes 2 identical strands)
each for 1 mark

6

(ii) order of bases acts as a code;
which controls the order;
in which amino acids are assembled into protein;
read in triplet
each for 1 mark

3

[15]

Q30.

(a) select for breeding;
the plants with the sweetest taste
each for 1 mark

2

(b) natural population has a wide range of variations;
because it has a large number of alleles;
selective breeding reduces the number of alleles;
cloning perpetuates this reduced number of alleles
each for 1 mark

4

(c) 3 of:
reference to cuttings;
reference to tissue culture;
reference to hormones;
cloning
each for 1 mark

3

(d) 4 of:
cut genes for disease resistance;
from chromosomes of 'cooking banana';
introduce into chromosomes of 'ordinary banana';
tissue culture to produce disease resistant plants/clone;
enzymes cut chromosomes
each for 1 mark

4

[13]

Q31.

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(a) Stan BB
Sharon bb
all offspring Bb

3

(b) Tom Bb
black offspring Bb
white offspring bb

3

[6]

Q32.

(a) (i) e.g. B and b

for 1 mark

1

(ii) e.g. bb

for 1 mark

1

(b) no black genes in flock
all double recessive

for 1 mark each

2

[4]

Q33.

(a) grow from parents,
by vegetative reproduction/asexual reproduction/
no sexual reproduction

for 1 mark each

2

(b) e.g. different environmental conditions/named condition

for 1 mark

1

[3]

Q34.

(a) mutation

for 1 mark

1

(b) fall,
idea that resistant beetles more likely to survive to breed,
∴ their offspring more likely to appear in the next generation

for 1 mark each

3

(c) inbreeding between resistant brothers and sister,
will produce some individuals with 2 copies of the resistance allele,
if 2 of these individuals breed all their offspring will be resistant

for 1 mark each

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3

[7]

Q35.

(i) DNA

for 1 mark

1

(ii) contains the code for manufacturing the protein,
as order of bases,
which determine the order in which amino acids are assembled into protein

for 1 mark each

3

[4]

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